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10/679,605	10/01/2003	Alan R. Arthur	200311576-1	5929

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EXAMINER
ALEJANDRO, RAYMOND

ART UNIT	PAPER NUMBER
1745	

DATE MAILED: 11/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.** 10/679,605	**Applicant(s)** ARTHUR, ALAN R.	
	Examiner Raymond Alejandro	**Art Unit** 1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 October 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-31,35-39,57 and 58* is/are pending in the application.

4a) Of the above claim(s) *5 and 31* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4, 6-30,35-39,57 and 58* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 October 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

This office action is responsive to the amendment filed 10/26/06. The applicant has overcome most of the objections, the 35 USC 112 rejections and the art rejections as applicable to all independent claims. Refer to the abovementioned amendment for specific details on applicant's rebuttal arguments and remarks. However, the present claims (including newly added claims 57-58) are non-finally rejected over new art as set forth below and for the reasons of record:

Election/Restrictions

1. Applicant's election of Group I and Species 1 (Claims 1-4, 6-30 and 32-39) in the reply filed on 07/19/06 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Drawings

2. The drawings were received on 10/26/06. These drawings are acceptable.

Claim Numbering

3. Applicant has clarified that "*in the originally-filed set of claims, the claims were misnumbered in that no claim numbered 54 was presented. Consequently, the claims have been appropriately renumbered herein to total 56*" (See 10/26/06 amendment on page 12). Therefore, applicant's two (2) new claims have been numbered 57-58.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claim 3 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The added material which is not supported by the original disclosure is as follows: (claim 3) the recitation that "*such that an air flow to said fuel cell stacks is made more equal by said air profiling manifold*". Applicant has stated that paragraph 0031 of the as-filed disclosure supports such amendment. However, a careful reading and understanding of paragraph 0031 reveals that it only supports the language "*to facilitate optimization of a flow profile over the fuel cell stack assembly by designing the location and the size of the cathode air entrance points in the cathode air profiling skin. This allows a designer to optimize flow to reduce thermal gradients induced by more typical plug flow designs*". There is no dispute that the as-filed disclosure describes optimization of the flow profile, but saying that such optimization refers to making the air flow more equal may be one of multiple different flow patterns that encompass "optimization of a flow profile". The examiner is not sure if applicant originally intended to just disclose flow optimization in general regardless of whether such an optimization necessarily translates to "*an air flow...made more equal...*". Bear in mind that the use of the foregoing language implies a specific amount of air flow or specific air flow distribution which is not supported by the as-filed

disclosure. On the other hand, optimization of an air flow in no way requires a specific amount of air flow or a specific air flow distribution, it only requires to obtain an optimized air flow pattern or profile.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-4, 6-7, 10-13, 16-23, 35 and 57-58 are rejected under 35 U.S.C. 102(b) as being anticipated by Elangovan et al 5480738.

The present application is directed to an integrated fuel cell stack and catalytic combustor apparatus wherein the disclosed inventive concept comprises the specific integration of a combustor with a fuel cell stack.

As to claims 1-2 and 19:

Elangovan et al disclose a fuel cell module (TITLE) with multiple fuel cell stacks having generally planar cross-flow grooved interconnectors with fuel and air flow channels therein arranged in multi-stack columns 14, 16 wherein adjacent stacks are joined by manifold frames 24, and pairs of columns are spaced apart across a central air plenum 28 in fluid communication with the air flow channels, and fuel flows serially through the stacks along the length of the column (ABSTRACT). Numerous spaced-apart columns (*the cavity*) of fuel cell stacks may be arranged in rows A-D (COL 6, lines 59-67). Each fuel cell comprises an anode, a cathode and an electrolyte (COL 4, lines 57-67). Reference numeral 42 represents the module housing (*may be considered the frame*) (Col 6, lines 50-55/ COL 7, lines 34-35); but also Elangovan et al disclose the use of frames 24 (COL 5, lines 15-32).

Elangovan et al disclose that fuel reformation is typically accomplished by a reforming catalyst that converts product steam from the fuel cell reaction and fresh hydrocarbon fuel into CO and H2 which are used by the cell (COL 7, lines 8-24). Thus, the fuel cell reaction thermodynamics are urged toward formation of product because of constant consumption of the product(COL 7, lines 8-24). In contrast to the reformers 46 of the dual column fuel cell module, the fuel reforming catalyst could be contained in the manifold frames disposed between adjacent stacks. The manifold frames may be easily adapted to contain the reforming catalyst, and are easily connected to the fuel cell stack (COL 7, lines 8-24). Reformer 46 contains a stream reforming catalyst (COL 7, lines 36-40). Reference numeral 34 represents the fuel inlets (COL 6, lines 35-46), also fuel gas enters the reformer 46 through conduit 48 (COL 6, lines 29-34).

Examiner's note: *in this instance, the examiner notes that reformers 46 of fuel cell stacks 14B-C and 16B-C, in a horizontal direction or diagonal direction, meets the requirement of being disposed at least partially within the spaced apart (the cavity) fuel cell stacks. In addition to that, the fuel reforming catalyst contained in the manifold frame 24 of 14A-D and 16A-D, in any direction (i.e. horizontal, vertical or diagonal) also meets the requirement of being disposed at least partially within the spaced apart (the cavity) fuel cell stacks. Since catalytic material in both the reformer 46 and the reforming catalyst contained in the manifold frame are activated by the heat or stream itself, it is contended that both reformer units have a catalytic igniter. In addition to that, it can be said that a fuel channel is defined in a space between the reformer* *units (the catalytic combustor) and the fuel cell stacks: 1) 14A and 14D, or 16A and 16D when fuel reformers 46 is/are taken as the reforming units, or 2) 14A-16A, or 14B-16B, or 14C-16C or 14D-16D when the fuel reforming catalyst is contained in the manifold frame 24 of 14A-D and 16A-D.*

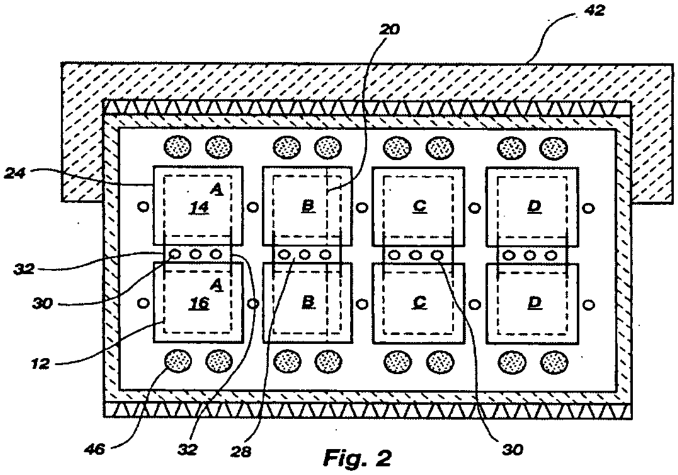


Fig. 2

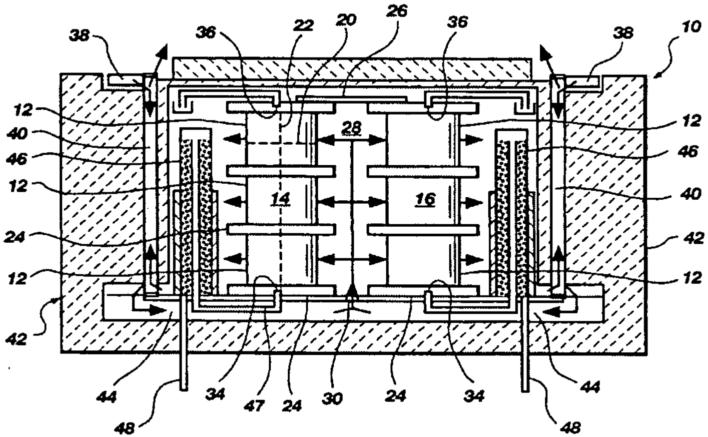
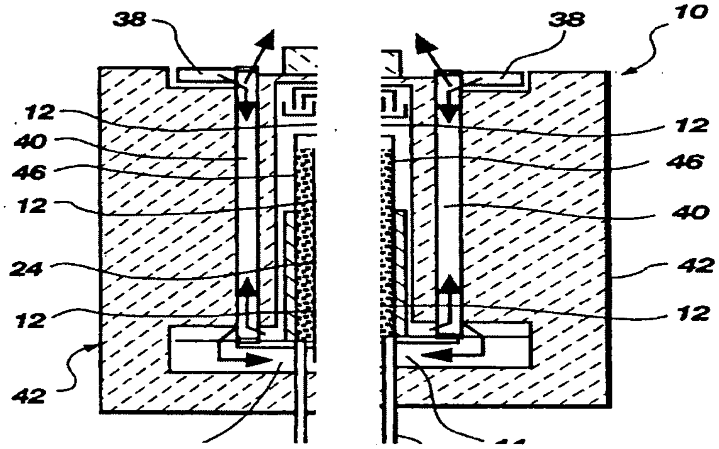


Fig. 1

As to claims 3-4:

Elangovan et al disclose the air flow pathway through the module when air enters the module through air inlets 38, thereafter the air is routed to a common air channel 44 where it flows through the plenum inlet 30 into the central air plenum (COL 6, lines 47-58). *Thus, the cathode air distribution system (the air profiling manifold) is disposed around the fuel cell* *stacks, and it can be said that it allows equal distribution of said air. Air conduit 40 divides what can be considered the outer skin and the inner skin having a plurality of openings enclosing the fuel cell stacks. In its broadest reasonable interpretation, the plurality of openings (holes) are the inlets themselves at the top part and the outlet themselves in the bottom.*



As to claim 6:

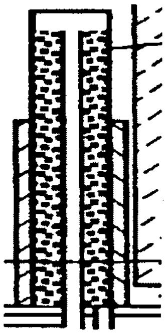
Either the common air channel 44 or the plenum inlet 30 allowing air flow into the central air plenum (COL 6, lines 47-58) can be taken as the oxidant (air) manifold.

As to claim 7:

The fuel flow pathway is comprised of conduit 48 allowing fuel gas to enter the reformer and fuel inlets 34. Thus, conduit 48 is in fluid communication with said fuel channel. *In this case, what is considered the fuel manifold and the oxidant manifold are coupled to a proximal end of the fuel cell stack assembly (See Figure 1 above).*

As to claim 10:

If the fuel reforming catalyst contained in the manifold frames (COL 7, lines 8-24) is taken as the combustor unit, then the frames themselves are the shell; if reformer 46 is taken as the combustor unit, then separation members located on opposed faces of the reformer unit 46 constitutes the shell. End

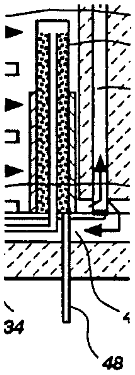


As to claim 11:

When the fuel reforming catalyst contained in the manifold frames (COL 7, lines 8-24) is taken as the combustor unit, then the frames must necessarily includes holes so as to allow the flow of fuel.

As to claim 12:

End points (top and bottom) of the reformer 46 represent respective distal end and proximal ends of the catalytic combustor.



As to claims 13 and 35:

Elangovan et al disclose fuel reforming catalyst contained in the manifold frames (COL 7, lines 8-24) and/or reformer 46 containing a stream reforming catalyst (COL 7, lines 36-40).

As to claim 16:

Elangovan et al disclose solid oxide fuel cells (Col 1, line 14-16/COL 7, line 40-43).

As to claims 17-18:

Elangovan et al disclose the use of porous ceramic materials for electrolyte plates (Col 1, lines 20-24/ COL 4, lines 61-64). *Absent further structural description of how the claimed substrate is structurally oriented or spatially employed, it can be asserted that the electrolyte plate per se is the base or substrate.*

As to claims 20-21:

It can be appreciated from viewing **Figure 1** below that module housing 42 consists of an upper member, a lower member and a transverse member mechanically forming the housing 42. It can also be appreciated that the lower member is in close proximity with respective fuel and oxidant/air distribution lines and to a proximal end of the fuel cell stack assembly.

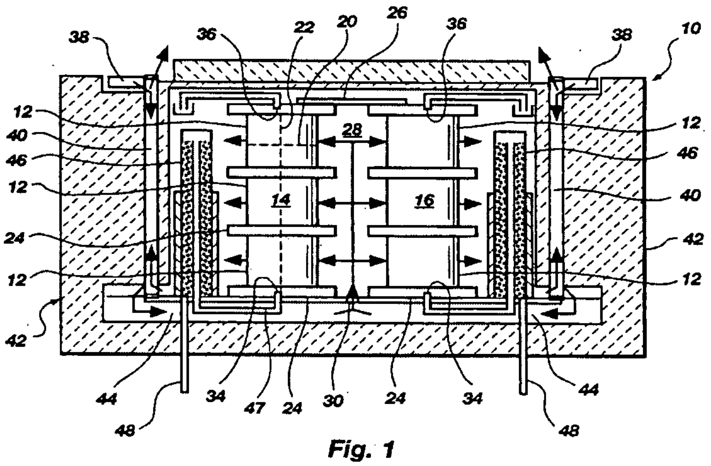
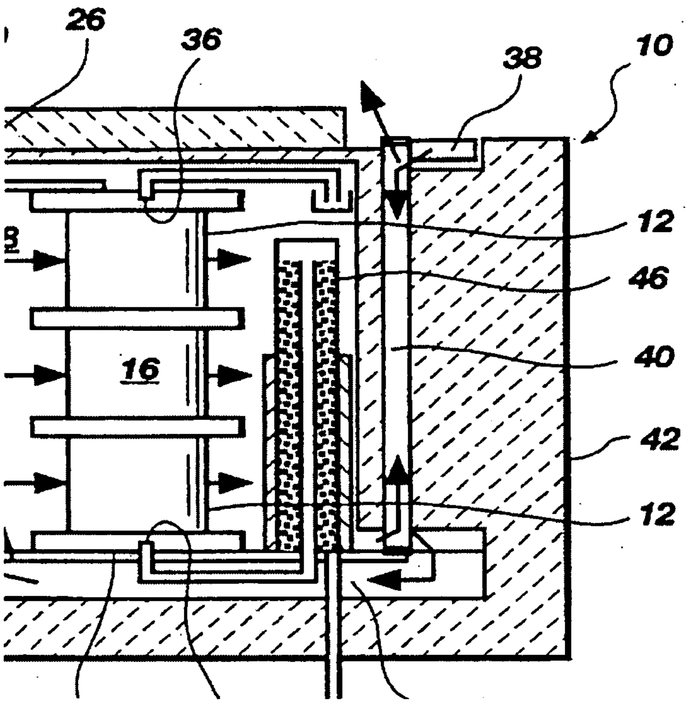


Fig. 1

As to claims 22-23 and 58:

Elangovan et al disclose that the air flow pathway through the module is shown by the **solid-headed arrows** (→) in FIGURE 1 (COL 6, lines 47-49). *By following the trajectory of the solid-headed arrows, it can be further appreciated that the fuel cell stack is in fluid* *communication with the air exhaust (near reference numeral 38), and that the upper member in combination with the transverse member form the air flow pathway toward the air exhaust.*



As to claim 57:

Elangovan et al teach that the fuel cell reaction thermodynamics are urged toward formation of product in combination with the reforming unit (COL 7, lines 14-18). *Thus, it can be reasonable concluded that the reforming unit effects the operating temperature of the fuel cell stack.*

Therefore, the present claims are anticipated.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Elangovan et al 5480738 as applied to claim 7 above, and further in view of Senner 2002/0102445.

Elangovan et al is applied, argued and incorporated herein for the reasons expressed above.

With respect to claim 9:

Elangovan et al disclose that the air flow pathway through the module is shown by the **solid-headed arrows** (→) in FIGURE 1 (COL 6, lines 47-49). *By following the trajectory of the solid-headed arrows, it can be further appreciated that the fuel cell stack is in fluid communication with the air exhaust (near reference numeral 38), and that the upper member in combination with the transverse member form the air flow pathway toward the air exhaust.*

However, none of the preceding references expressly disclose the specific flame arrestor.

Senner describes fuel cells (P0003), the integration of a catalytic combustor with a fuel cell system (P0007); and the use of a flame arrestor in the front of a combustor (P0041).

In light of these disclosures, it would have been obvious to a person possessing a level of ordinary skill in the field of the invention to use the specific flame arrestor of Senner in the fuel cell system of Elangovan et al as Senner discloses the suitability of using a flame arrestor in the front of a combustor to assist in preventing flame entering or diffusing into the fuel cell system.

11. Claims 13, 24-30 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Elangovan et al 5480738 as applied to claim 19 above, and further in view of Kearl et al 2004/0081871.

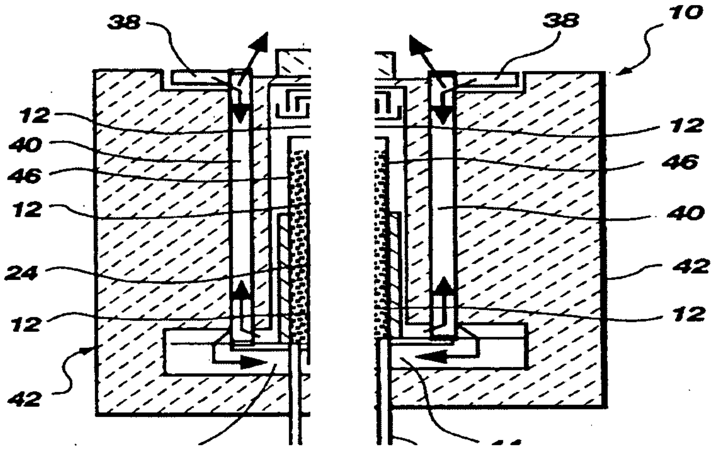
Elangovan et al is applied, argued and incorporated herein for the reasons expressed above. Additionally, Elangovan et al disclose the following:

With respect to claim 25:

Elangovan et al disclose a fuel cell module (TITLE) with multiple fuel cell stacks (ABSTRACT) and multiple reformers 46 and/or fuel reforming catalyst contained in multiple manifold frames 24 (COL 7, lines 8-24).

As to claims 26 and 29-30:

Elangovan et al disclose the air flow pathway through the module when air enters the module through air inlets 38, thereafter the air is routed to a common air channel 44 where it flows through the plenum inlet 30 into the central air plenum (COL 6, lines 47-58). *Thus, the cathode air distribution system (the air profiling manifold) is disposed around the fuel cell stacks, and it can be said that it allows equal distribution of said air. Air conduit 40 divides what can be considered the outer skin and the inner skin having a plurality of openings enclosing the* *fuel cell stacks. In its broadest reasonable interpretation, the plurality of openings (holes) are the inlets themselves at the top part and the outlet themselves in the bottom.*



As to claim 27:

Elangovan et al disclose a module housing 42 (COL 6, lines 52-56). *In this case, the examiner asserts that the housing itself* *inherently* *provides electrical grounding characteristic.*

As to claim 28:

Disclosed is that the fuel cell stacks include anodes therein (col 1, lines 22-26/ col 4, lines 63-67).

However, the preceding reference fails to expressly disclose the specific igniter wire; and the specific catalytic beads.

Kearl et al disclose a fuel cell using a catalytic combustor (TITLE) wherein the catalytic combustor 107 including the catalytic element 211 comprises a coil-shaped resistive element 212 and a current source 212c (P0055-0056/FIGURE 2a). Kearl et al also disclose that the structure of the catalyst may take many forms such as ceramic beads (P0054).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific igniter wire of

Kearl et al in the fuel cell system of Elangovan et al because Kearl et al disclose that their coil shaped resistive element is positioned such that it can heat the catalytic element to facilitate the combustion reaction. Thus, Kearl et al disclose the use of coil shaped resistive element (the specific igniter wire) for the benefit of improving combustion reaction.

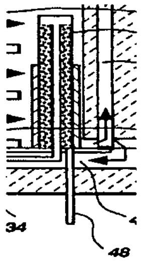
As to the specific catalytic beads, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific catalytic beads of Kearl et al in the fuel cell system of Elangovan et al because Kearl disclose that that the structure of the catalyst may take many forms such as ceramic beads (P0054) so long it provides the intended catalytic activity.

12. Claims 14-15 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Elangovan et al 5480738 as applied to claims 1 and 19 above, and further in view of Girod et al 5525311.

Elangovan et al is applied, argued and incorporated herein for the reasons expressed above. Additionally, Elangovan et al disclose the following:

With respect to claim 15:

Figure 1 of Elangovan et al also illustrates end points of the reformer 46 represent respective distal end and proximal ends of the catalytic combustor (FIGURE 1).



However, the preceding reference fails to expressly disclose the specific catalytic profile of the catalytic bed.

Girod et al disclose catalyst reactor arrangement (COL 3, lines 20-25/FIGURE 3) useful in a wide variety of catalytic reactions such as hydrocarbon conversion including reforming (COL 4, lines 64 to COL 5, line 10) containing multiple reaction zones to effect catalytic reaction (COL 9, lines 45-53). Girod et al specifically disclose catalytic reforming reactions (COL 13, lines 27-30) in a moving bed reaction zone or a fixed bed (COL 13, lines 50-60) in reaction zones having different temperature profile or gradient attributed to catalyst variation (COL 2, lines 15-25).

In light of these disclosures, it would have been obvious to a person possessing a level of ordinary skill in the field of the invention to use the specific catalytic profile of the catalytic bed of Girod et al in the fuel cell system of Elangovan et al as Girod et al discloses the suitability of a varied catalytic profile in a catalytic reactor for reforming hydrocarbon. Particularly, Girod et al discuss the advantages of precisely controlling the temperature conditions of the reactor; or operating the reactor under isothermal or other controlled temperature conditions; or maintaining a desired temperature profile in a specified arrangement.

13. Claims 37-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Elangovan et al 5480738 as applied to claim 20 above, and further in view of Peterson 2004/0157096.

Elangovan et al is applied, argued and incorporated herein for the reasons expressed above. However, preceding reference fails to expressly disclose the specific current collection assembly.

Peterson disclose *a solid oxide fuel cell (SOFC)* with a double envelope design wherein the modular thermal management package provides power supplied by incorporating two electrode connectors 11 which connect the envelope 10 for supplying power to external devices (P0031); and a plurality of connectors to receive and supply electric power (P0012).

In light of these disclosures, it would have been obvious to a person possessing a level of ordinary skill in the field of the invention to use the specific current collection-power stack collector assembly of Peterson in the fuel cell system of Elangovan et al as Peterson discloses that a current collection-power stack collector assembly allows to connect the specific power generating fuel cell to external devices to supply the generated power. Thus, such assembly provides the electrical connection necessary to distribute the generated electric power.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (571) 272-1282. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Raymond Alejandro
Primary Examiner
Art Unit 1745

RAYMOND ALEJANDRO
PRIMARY EXAMINER